

ABSTRACT

5 In at least one embodiment, the apparatus of the present invention is a heat
exchanger which includes a core having a thermally variable size and a support
structure. To minimize, or eliminate, differential thermal expansion, the support
structure is connected to the core and thermally deforms to accommodate variations in
the size of the core. The support structure employs a thermally deformable member
10 which can be a tie rod with a planar center section. In other embodiments, the support
structure includes a first strongback, a second strongback, and at least one variable
thickness tie rod mounted between the strongbacks. The variable thickness tie rod can
be a broadened end tie rod having an end or ends which are thicker (wider) than a
center section. The present invention also includes methods of fabrication. One
15 embodiment includes the steps of obtaining a tie rod having a substantially uniform
thickness and forging the tie rod to define a planar center section. Another
embodiment includes obtaining a tie rod of uniform thickness, forging a first end of
the tie rod to broaden the thickness of the first end, and applying threads to the first
end of the tie rod.